

The Energy Farm Narrative Description.2

Over the course of the last 10 years, I have been involved in developing a two-step approach to teaching and implementing technology. The first step introduces students to technology in the classroom. In step two, students are encouraged to apply the technology in real-world settings.

Classroom Approach

Following is a list of 4 technologies I currently use in my classroom with a brief description of each. **1.** I introduce students to compasses (they learn how to make their own compass) and map reading. Later, we introduce students to more advanced technology by helping them learn how to navigate using a GPS receiver. **2.** Students learn all about robots and then build robots that we enter in the annual robotics competition in our area. **3.** Students learn how to raise fish in our aquaculture facility. Part of the fish-rearing process involves careful monitoring of water quality. We teach them how to monitor water using water test kits and then we introduce them to advanced water quality monitoring technology using computerized equipment. **4.** Students are introduced to solar energy, wind energy, fuel cells, and bio-fuels as part of our alternative energy curriculum. Then they use classroom sets of these technologies to build working models of fuel-cell-powered cars, solar cars, windmills, etc.

Real-world approach

Wherever possible I try and provide students with opportunities to use the technology they learned about in the classroom in real- world settings. For example, we provide students with opportunities to use GPS skills to map things for community agencies like noxious weeds for the county weed department. For another example, we have provided students with opportunities to tissue culture potato seedlings for a local farmer. In terms of water quality issues, students are able to use their skills with water quality monitoring to help with projects for the Department of Fish and Game.

One of our most ambitious, real-world projects has been the development of a 20-acre educational center. This center contains historical buildings, gardens and orchards, equine facilities, a barn, a “dig site” and an experimental farm and is called the Historical Park. Students and teachers or community members can visit the Historical Park to learn all about their community. We also use the facility as a research/teaching site. For example, we conduct research projects on such things as experimental crops, new growing methods through the high school ag program. We also invite irrigation experts to conduct classes at the farm to teach students or budding entrepreneurs about current irrigation methods.

Our proposed Energy Farm will be an addition to the Historical Park. Students and community members will be able to visit the Park and see examples of alternative energy sources at work. Students will also be able to conduct experiments using these alternative energy sources and will be able to teach the community about the technologies. We intend to develop the Energy Farm in phases. The first phase will focus on bio fuels. As we are able to incorporate additional energy technologies, they will be phased into the Energy Farm.

The Energy Farm Narrative Description.3

The use of technology in the classroom, including a curriculum that incorporates classroom use of technology with opportunities to use technology in real-world settings, has had definite impacts on my students. The impact on student performance can be measured in four ways:

1. Confidence and motivation

Based on teacher and parent observation, students who are exposed to advanced technologies and who have learned to use them effectively have a stronger measure of confidence. They have had to stretch to learn how to use new technologies, also how to apply their technological skills in new applications. As a result, their confidence in their abilities to learn and to apply increase dramatically. Mastering new technologies also helps motivate students to learn the science associated with these technologies.

2. Performance on standardized tests.

Over 75% of my students scored within the proficient range on the science portion of the Idaho Scholastic Achievement Test. I have been the science teacher for these students for the last 2 to 3 years. While it is difficult to prove that the use of technology in the classroom has resulted in high scores on the ISAT, it is safe to say that using technology in our approach has not hurt their test results.

3. Career exploration

In any given class, students get to experience, on a limited basis, a wide variety of career options. Since most careers now make use of advanced technologies, students get to experience what those careers might look like as a future job. Sometimes students come to realize that what they thought would be an interesting career really holds little or no interest. On the other hand, some students get turned on to a specific career as a result of their real-world experience. To cite specific examples, one former student put himself through college by hiring out as the GPS coordinator for his county. Two other former students have started their own GPS consulting business. A young lady worked directly with a civil engineer to learn how to survey the area for the Historical Park, and how to draw architectural drawings. As a direct result of her experiences, she has now finished a degree program in architecture.

4. Helping to meet the Idaho Content Standards

Some of the standards are difficult to achieve without using technology and science concepts together. For example in standard 5 for grades 8-9 we read: "explain how science advances technology and technology advances science." Using a hands-on, real-world approach with technology and science makes it much easier for students to grasp these relationships.

The Energy Farm Narrative Description.4

We believe that a curriculum based on alternative energy topics can provide wonderful learning opportunities for students. The topic is relevant what with major concerns over rising fuel costs, greenhouse gases and global warming issues, depletion of non-renewable energy stores, etc. Energy topics are impacting all of our lives and yet there are viable solutions. We intend to use the purchases from this grant to not only teach the science behind alternative energy technologies, but also to demonstrate how technology can help solve many societal problems. The purchases to be made with these grant monies will be in two categories: phase one of the Energy Farm to be installed at the Historical Park, and classroom curricular materials.

Energy Farm (Phase One)

Visitors to the Energy Farm will be able to see alternative energy devices at work. When fully operational, the Energy Farm will have a windmill, solar devices (for both heat and electricity), vehicles and heaters running on bio fuels, and operational fuel cells. The devices will also have explanations, discussions of the pros and cons that apply to the technology, and monitoring methods so students can see the energy output of the devices. We intend to develop the Energy Farm in phases. The first phase will focus on bio fuels. We have decided to use the bulk of the monies from this grant to develop that phase. We have chosen to start with bio fuels since it best complements the other components that are already in place at the Historical Park. Also, we are in the process of negotiating with companies who deal with the other alternative energy sources and feel confident that they will donate their devices once the first phase of the Energy Farm is in place.

When fully developed, the bio-fuels component will demonstrate the complete process of producing bio fuels. We will grow oil seeds, extract oil from the seeds, feed the residue to our farm animals, process the oil into bio fuels, and then use the bio fuel either to drive vehicles or to heat buildings at the Historical Park. Another benefit to using the bio-fuels alternative energy source comes from our ability to convert waste cooking oil from the high school kitchen to bio diesel to be used in district buses. Developing this energy source will also allow us to demonstrate the viability of bio fuels for our local farmers.

Classroom Materials

We intend to use some of these grant monies to purchase curriculum materials that will be used to teach students about the alternative energies. Teachers will be able to use these materials to teach the science behind the alternative energy. The teachers will also be able to show students how technology can help solve societal problems. Initially, the curriculum materials will be geared to students in grades 6-8 and will provide for a great deal of hands-on learning. Students will be able to make small-scale projects using the same technologies they will see when they visit the Energy Farm. This should make the student visits to the Energy Farm all the more interesting and informative.

The Energy Farm Narrative Description.5

Over the course of the last 2 years we have been developing curricular materials for energy topics. We have used the materials to help teach students the science behind energy topics as well as helping them to see how technology can solve serious, societal problems. We want to use a portion of these grant monies to expand the program by developing a traveling set of curricular materials that teachers can check out to help teach alternative energy topics. The curricular materials will be used prior to the visits to the Energy Farm to help prepare students as well as after the visits for follow-up activities. The curriculum will provide for hands-on activities as well as suggestions for discussions and research topics.

Hands-on Activities

The classroom materials will be used to teach and demonstrate all about such topics as wind energy, solar energy, fuel cell technology, bio fuels, nuclear energy and assorted topics dealing with electricity. Students will learn how electricity is generated using magnets and wire. They will learn how motors work. They will be able to build generators that can be powered by wind or water. They will be able to use small solar cells to drive motors or pump water or to drive vehicles. They will be able to use fuel cells to drive small motors or to build fuel-cell-powered cars. They will be able to build working windmills. They will be able to extract oil from oil seeds and use the oil to generate heat. They will also be able to conduct simple experiments with nuclear topics.

Discussion and Research

Every energy source has positive and negative aspects associated with it. The curricular materials will help students understand the pros and cons to the energy sources so they can make wise energy choices. For example, building solar cars that don't work on cloudy days is a graphic way to reinforce one of the downsides to solar energy.

Rising fuel costs and diminishing fossil fuel supplies has brought about some amazing technological developments. Some of these developments focus on capturing energy from waste sources while others utilize renewable resources in very efficient ways. The curriculum materials will also encourage students to research these innovations. Their research cannot help but demonstrate how technology can help solve societal problems.

The Energy Farm Grant Expenditure Plan

		Materials and Supplies		Capital Objects		
1. Develop Bio Fuels Portion of Energy Farm						
	Make bio diesel from vegetable oil			Fuel Meister II Converter with accessories	\$3830	\$3830
	Press oil seeds into vegetable oil			Oil seed press with accessories	\$2950	\$2950
2. Develop alternative energy curriculum						
	Make fuel cell classroom set	Fuel cell kits	\$1220			\$1220
	Make solar energy classroom set	Solar kits	\$550			\$550
	Make wind energy classroom set	Wind mill kits	\$630			\$630
	Purchase demonstration materials for nuclear, hydroelectric, etc.	Demonstration materials	\$540			\$540
Total			\$2940		\$6780	\$9720